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GEOGRAPHICAL NOTES AND NEWS

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Miss Uttley is an assistant professor of geography in the State Teachers College at Cedar Falls, Iowa and an effective leader in the field of geographic education. She is co-author of a "Course of Study in Geography for the Elementary Schools of Iowa" and author of a "Series of Lesson Plans in Geography for the Seventh Grade."

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Mr. Finch is Director of the Training School at the State Normal College, Dillon, Montana and represents his state on the Board of Directors of the National Council. At present he is on a leave of absence to pursue his graduate work at Columbia University. He is author of "Destructive Farming" and "Montana" in the *Journal of Geography*, Volumes V and XVI respectively.

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Miss Grime is a teacher of Latin in the Sumner County High School, Portland, Tennessee. Becoming interested in geography she has made it one of her graduate subjects at George Peabody College for Teachers.

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do we close our eyes to the people everywhere about us? Do we see no more than the land and water facts of the countries through which we pass? Are we content to get our impressions from the pages of our guidebook?

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The JOURNAL of GEOGRAPHY

VOLUME XXII FEBRUARY, 1923 NUMBER 2

NOTES ON THE HAWAIIAN ISLANDS

STEPHEN SARGENT VISHER
Indiana University, Bloomington

The Hawaiian Islands form today perhaps the most important territorial possession of the United States, in spite of the fact that Alaska is nearly ten times as large (590,000 vs. 65,000 sq. mi.) and Porto Rico had five times as many people in 1920 (1,300,000 vs. 260,000). In trade with America, Hawaii is more important than either Porto

FIG. 1. An avenue of date palms in Honolulu

Rico or the Philippines, each of which have had approximately $200,000,000 of trade in recent years. In strategic importance Hawaii is considered to be far the most valuable possession. The population of Hawaii exceeds that of three states, Delaware, Wyoming and Nevada, and almost equals that of the last two combined.

IMPORTANCE OF "THE ISLANDS"

The importance of "The Islands" as they are called in California, depends upon several factors: first their position in respect to the West Coast in general and the Panama Canal in particular. They are the nearest considerable body of land in the North Pacific, and so located

in respect to other lands as to have become "the cross-roads of the Pacific." Furthermore, they form an outer fortress of great value in the defense of the Panama Canal. The second factor in their importance is their climate. (a) Tropical crops in great variety thrive. (b) The Islands form a splendid winter resort, and are much cooler in midsummer than most parts of the continental parts of the United States. (c) The islands form a climatic outpost of the tropics. The United States Weather Bureau is gathering data on the Islands of significance to the great tropical half of the world. Likewise the experiment of highly civilized white men in the tropics is being carried on in a climate which is chiefly tropical, tho far less trying than many other tropical climates. The third way in which "The Islands" are important is that

FIG. 2. On the wet side of Hawaii 200 to 300 inches of rainfall support a dense growth of tree forms and other tropical forest plants.

there the race problem is being experimented with on a large scale. Hawaii has been called the "Melting Pot of the Pacific." The make-up of the population suggests this: Japanese 110,000, Chinese and Korean 28,000, Hawaiians 24,000, Hawaiian-Chinese 7,000, Hawaiian-white 11,000, Teutonic 20,000, Portugese 27,000, Filipinos 21,000, Porto Ricans (and others of Spanish descent) 8,000. In addition there are 600 "others" (Negroes, south sea islanders, etc.) The results of this intermingling of races are not all clear. A few results, however, are obvious. One is that the native Hawaiians are no match for some of the immigrant races. Today there are scarcely a tenth as many Hawaiians as there were a century ago. Altho they formerly owned all of the land, they now own much less than one-tenth of the real property and

only one sixty-third of the personal property. This is in spite of their splendid physiques, fine appearances and widely praised temperaments. Obviously stature, musculature, grace and kindliness are less valuable in a struggle for existence than are ambition, industry, persistence and mental alertness. The Hawaiians are making only a feeble effort to stem the tide which is engulfing them. For example, in this age of higher education, few of the descendants of even the former rulers of the land are taking the trouble to get more education than the law requires. On the other hand, children of Oriental coolies are crowding into the high schools and even into the University of Hawaii where today they far outnumber the whites.

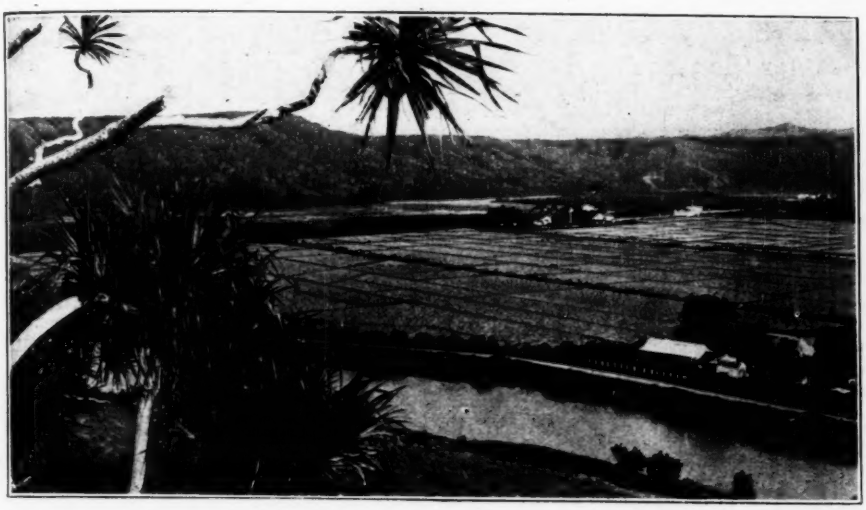

FIG. 3. A beautiful irrigated valley on the northernmost island, Kauai. The crop is rice. The mountain peak showing faintly at the right is the one where nearly 500 inches of rain is recorded annually at the summit.

The half-caste Hawaiian-Chinese appears to be superior to the pure Hawaiian. Their birth rate is about twice as high and the death rate only about half as great as that of the Hawaiians. They also work much more effectively and have become comparatively well-off. Physically too they are superior to either parents in some respects, being neither ponderously heavy, as are many Hawaiians, nor small and frail as are many Chinese.

Both the Oriental and the European races appear to be under no great climatic handicap in the islands. The health of the white Americans in Hawaii is said to compare favorably with the health of similar classes in northeastern United States. Their longevity is notable

and their death rate phenomenally low (6 per 1,000 in 1920). There are some white children of the fourth generation born on the islands and leading physicians report no physical or mental deterioration. However, the test is inconclusive for most of the children of the original missionary families have married persons from the continent, and many of them have spent years at school in the invigorating northeastern part of the United States. However, so far as the death rate indicates healthfulness, the climate is salubrious, for the death rate for the average of the entire Territory was 13.7 in 1920–21 and only 17.5 in 1919–20, in spite of heavy loss from influenza. The death rate of the Teutons averaged only 6.7 in these two years, while that of the Hawaiians averaged about 40 per 1,000 or six times as great. (The death rate in the registration area of the United States averaged 15.2 per 1,000 for the years 1900 to 1919 inclusive.)

Fig. 4. Sisal fiber drying after going thru the mill. A sisal field is shown in the background.

Whites perform little manual labor in the cane fields, but it is not because temperatures are higher than in the northeastern states in summer, for they seldom rise above 85°, and an invigorating wind, the Trades, is nearly always blowing, reducing the sensible temperature to below that indicated by the thermometer. Indeed a temperature of 80° usually does not feel very hot in Hawaii, provided the breeze strikes one's face.

The great reasons why whites do little work in the field in Hawaii are that those now in the islands do not need to. Formerly many whites did field work there. For instance, thousands of illiterate Portuguese were brought in three decades ago and worked in the fields successfully, but their children having become somewhat educated and Americanized find work in the prosperous cities. Many of them are very good citizens.

EXAMPLES OF INSULARITY

A fourth great way in which the islands are important is as an illustration of insularity. Not only have there been many effects of insularity in the aborigines, and in the native biota, but numerous happenings since the coming of white man are related to the consequences of insularity. The decline in the native Hawaiian population and of the flora and fauna are illustrations. Upon isolated islands, life is too simple for the development of highly resistent forms. When forms which have evolved upon continental masses with their varied flora and fauna and keen competition are introduced into oceanic islands, the island forms usually are soon displaced.

FIG. 5. A railroad thru a cane field.

Not only have the full-blood Hawaiian people become so few as to be almost a curiosity in many parts of the islands but the plants of the lowlands are almost all introduced species and the birds, insects and other animals likewise. The chief birds are the English Sparrow, the Mynah bird from India, the Chinese dove, the Japanese rice bird, and the Chinese thrush. The latter is still restricted to Oahu and is not yet common, but is notable as the one songster. None of the native birds were good songsters. Possibly the lack of well-marked seasons, was not conducive to the development of singers.

Not only have foreign plants occupied nearly all of the lowlands but some of the more conspicuous mountain species are also introduced

forms, coming in all probability from Asia.[1] The two predominant trees of the lower forest are the Kukiu or Candlenut (Aleurites) and the Ohia or Mountain Apple (Eugenia). The former, on account of its pale silvery green leaves, is conspicuous from a great distance. These two small trees and many others are widely used by the Polynesians and were carried by them in their wanderings.

The prickly pear, from America, covers many dry rocky slopes and few would imagine that it is a recent arrival.

Of the insects, twenty of the twenty-one species of ants are recent arrivals, all the mosquitos are of introduced species, as are hundreds of other species of insects. One economic entomologist lists twenty-six species of insects which have become permanently established in recent months.

There were no native mammals. Now the Indian mongoose is found almost everywhere. It was introduced to check the Norwegian rat, but failed to stop at that. An Asiatic deer, introduced in Molokai, thrives in the primeval forest, and affords sport to army officers, who fly from Honolulu for a few hours hunt on this island.

One result of insularity so far as the original flora and fauna are concerned is the absence of many forms characteristic of many of the continents. Also many species had only a very restricted habitat. Altho the Hawaiian Islands are within sight of one another, many native birds and insects were found only on one island, or perhaps on those closest together. Because of the slight advantages of flight, far out in the ocean, the descendants of many forms lost the power of flight or nearly lost it. This is true of numerous birds and many insects whose relatives on the continents are good fliers.

Another consequence of insularity was the early use of wireless telegraphy. Commerical requirements did not warrant an inter-island cable, for cables are very expensive. However, proximity, climate and economic conditions all were favorable for the wireless. It is claimed that the first extensive commercial use of this method of communication was made here. The island of Oahu, upon which Honolulu is located, has four immense stations now, one with receivers 600 feet high.

RESULTS OF ISOLATION

A fifth respect in which the Hawaiian Islands are important is as an example of remoteness. Many biologists have studied the flora

[1] W. E. Safford, Cultivated Plants of Polynesia. Proc. 1st Pan Pacific Conf., Vol. 1, p. 186, 1921.

and fauna with the view of learning which species found their way to the islands, how they came and where they came from, and which species evolved from the few original introductions. Most species except truly marine forms are endemic, that is, known from nowhere else. Seven species of arrivals (from South America) are believed to have given rise to the 139 species of passerine birds found on the islands by the first scientific collectors.[2] Many of them are now extinct. Likewise two species of hymenaptera are believed to have been the ancestors of scores of endemic forms. The human migrations have likewise been of much interest. The early Hawaiians were certainly daring navigators.[3]

Another result of remoteness was the paucity of species. The Hawaiian Islands had far fewer species of plants and animals than had islands like Samoa and Fiji, which were less remote from the East

FIG. 6. A rice field near Honolulu, on Oahu, with partly Americanized Orientals at work. Note the sunbonnets worn by the laborers, and the coconut palms on the skyline.

Indies and Asia. Food plants were few in number. The ancient Hawaiians depended chiefly on only one species, the taro, from which "poi" a highly fattening food was obtained. Such a diet helps explain their obesity. However, Dame Fashion played her part. Since fleshy people cannot work so well as lean ones, corpulance suggested opulence, and hence princesses and many others gorged themselves with fattening food. In the Bishop Museum are various devices used to massage the abdomen to facilitate digestion!

REMARKABLE VOLCANOES

A sixth interesting aspect of the Hawaiian Islands is vulcanism. The entire group of islands is strictly volcanic, the cones rising from

[2] Fauna Hawaiiensis, Vol. Vertebrates.

[3] See Elsdon Best, Polynesian Navigators. *Geog. Rev.*, Vol. V, pp. 169-181, 1918.

depths of nearly 20,000 feet to a height of nearly 14,000 feet at the summit of Mauno Kea. The island of Hawaii is the site of Mauno Loa and Mauno Kea, two of the world's famous active volcanoes. They have been carefully studied, and much has been learned of vulcanism as a result. A volcanic observatory is maintained by the United States Weather Bureau with Professor T. J. Jaggar in charge.

VALUABLE AGRICULTURAL PRODUCTS

The Hawaiian Islands are likewise important for the crops which they yield, which in turn are largely a result of climate and location. The chief crops are sugar cane, pineapple, corn and rice, in order of acreage. Cane is by far the most important and sugar to the value of nearly $300,000,000 has been exported in three recent years (1919=72; 1920=116; and 1921=91 million dollars). Pineapple, the second crop has been exported to a total value of $60,000,000 in the three years, about one-half in 1921. The other exports, coffee, honey, and hides, have a small total value of about $5,000,000 a year.

COMMERCE BETWEEN "THE ISLANDS" AND "THE STATES"

The aspect in which Hawaii is of most interest to many is the commercial. A considerable volume of imports from continental United States are absorbed in Hawaii (1919=44; 1920=59; and 1921=77 million dollars). First in value comes iron and steel (8, 9 and 14 million a year for the past three years), next comes oil, the great fuel (5, 7, 10 million dollars a year); third comes bread stuffs (3, 6, 5 millions a year); fourth in average value comes wood and lumber (2.9, 4.5, 4.7 million a year); next comes automobiles (1.3, 3.3 and 4.7 million dollars a year). Citizens claim that Honolulu has more high priced automobiles in proportion to population than any other city in the world.

UNUSUAL SCENIC BEAUTY

The scenery of "the Islands" is very attractive. Many of the slopes are extremely steep, many have a curiously fluted appearance; the contrast between the bush, the cloud-covered mountains and the drier, often semi-arid lowlands, is great. The sea shore is made uncommonly beautiful by the deep blue of the water, the glistening line of breakers along the edge of the coral reef, and the graceful palms. Clouds too add more beauty than usual to the Hawaiian scenery. Great white domes are common. Masses of clouds hurrying up the windward slopes of the mountains and dissipating soon after the summit is reached afford an interesting type of cloud effect which is rarely

seen in most parts of the world. Another phenomena of great beauty is associated with the volcanoes. At night the glowing lava, with its spurts of burning gas often is visible by reflection from lofty clouds and forms a never-to-be forgotten view. Photographs do the scenery scant justice, because they lack color and depth.

NOTABLE SCIENTIFIC EXPERIMENTS

Many persons have a special interest in Hawaii because of the experiments being carried on there in combating insect pests by the use of the pests' natural enemies. The Hawaiian government and the Sugar Growers Association have done notable work in discovering, often after long search in distant tropical lands, enemies which hold in check forms which, when introduced to Hawaii have become de-

FIG. 7. A field of pineapples set off by trees and mountains.

structive to the cane and other valuable crops. After these natural enemies have been discovered, and introduced, many other growers of tropical plants elsewhere profit greatly. This has happened in Fiji, Australia, Java, the West Indies, etc. Hawaii has led the world in this type of investigation, and at present a dozen skilled entomologists are employed to carry on this difficult but highly valuable work. Not only are the growers and users of tropical plants interested in this work, but sugar beet growers and many others are vitally concerned with its success for each serious cane pest which is conquered makes it that much easier for cane to rival beet in sugar production.

CONSPICUOUS CLIMATIC CONTRASTS

Hawaii also presents many climatic features of interest. On Mt. Waialeale, Kauai, the northernmost large island, more than 500

inches of rain have been recorded annually during a number of years. This station therefore appears to be the wettest anywhere in the world, where the rainfall is officially measured. Yet within a very few miles from this rainiest spot less than twenty-five inches are received annually. Indeed one of the most striking climatic features of the group is the large number of local climates. Mr. L. D. Daingerfield, Section Director of the United States Weather Bureau, reports that there are at least seven major types of climate in the islands, and in each of these there is considerable contrast. Indeed he says that there are seventeen chief types, with many minor ones. For example,

Fig. 8. Native Hawaiians at a feast, showing characteristic homes and clothing. The animals are small pigs.

Honolulu, which comes in the lee coasts major type has several subtypes. The rainfall within the city limits varies from less than twenty-five inches in the rainshadow of Diamond Head, to a twenty-one year average of over ninety inches only five miles away at an elevation of 210 feet in a steep valley which has its head near the narrow divide. Within four miles of the central, downtown station with its thirty-one inches of rain is a suburban station at an elevation of 1,360 feet which receives an average of 106 inches. Between the point where twenty-five inches is received and the one where 106 inches are received there are numerous intermediate types of rainfall, cloudiness and humidity.

One of the suburbs is on a ridge about a thousand feet above the city. It is swept by the wind almost continually, and no one is too warm even in the hottest weather when seated in the shade on this ridge in a strong evaporating trade wind. At low elevations there is much contrast in night temperatures in short distances. Where the cold night air can flow down a valley from the mountains, which rise to 3,000 feet a short distance behind the city, it is always cool enough at night, they say, to make a blanket desirable. But between the ends of the mountain valleys, and also in the middle of the city, the nights are often a bit too warm for even a sheet. The sea is another complicating factor. The sea-breezes give the littoral fringe of the city still another type of climate, for where such breezes blow the heat of mid-day is pleasantly tempered. But sea-breezes usually penetrate only a short distance inland.[4]

INTERESTING METHODS OF IRRIGATION

Hawaii is interesting in so many respects that it is difficult to know where to stop the enumeration. A twelfth respect may serve to close this series of notes. Hawaii is notable for irrigation. This is of three kinds: (1) ordinary irrigation from streams, chiefly on the wet side of the islands, with rice as the main crop, (2) from wells, and (3) most interesting of all, the irrigation of cane fields on the drier side of the islands by water gathered on the wet side. Cane yields more sugar per ton on the sunny side of the islands, and in addition there is much more tillable land on the drier side. Since many of the mountain divides are very narrow, it has been feasible to tunnel thru at a number of points and conduct the abundant rainfall gathered in lateral ditches on the wet side, thru the mountain to the dry side where it is used to excellent advantage. At other points ditches carry water from the wet side to the dry thru passes in the mountains.

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THE COMMERCE OF THE HAWAIIAN ISLANDS—A SEVENTH GRADE PROBLEM[1]

MARGUERITE UTTLEY
State Teachers College, Cedar Falls, Iowa

This paper is designed to serve as preparation for the geography teacher who plans to present a study of the Hawaiian Islands to a seventh grade group. The discussion is organized around a problem which thru an interpretation of the Hawaiian Islands will demonstrate the interdependence of tropical and middle-latitude lands. The three-fold aim of the teacher is (1) to show the dependence of a tropical island-group upon an agriculture which furnishes commodities chiefly for export, (2) to show the possibility of such an agricultural development because of the favorable physical environment, and (3) to show the practicability of this development because of the demand in the world markets for Hawaiian commodities.

THE PROBLEM

The Hawaiian Islands lie in the midst of the largest ocean, a five-day voyage from the nearest continental port, San Francisco. These islands are distant not alone from the United States, but are more remote from any other important land. Despite their reputation as the "Cross-roads of the Pacific," they have not the advantage of being on the great circle trans-Pacific routes. So far off the great circle route between San Francisco and Yokohama are they, that a ship adds 750 miles to its trans-Pacific voyage by calling at Honolulu. Practically no trans-Pacific liner sailing from Vancouver or Seattle for the Orient stops at the islands. Yet these wonderfully fertile islands, the so-called "Garden Spot of the Pacific" depend upon lands thousands of miles away for half of their food, for practically all of their clothing, and for markets for their important crops. Into the tropical forest they import lumber, onto highly productive soil they import staple foodstuffs, into a good cotton climate they import cotton cloth. They depend upon the outside world also for petroleum, coal, and

[1] Paper presented at the Ann Arbor meeting of the National Council December 26, 1922.

practically all needed manufactured articles. So complete is this dependence, that, even in this land of luxuriant vegetation, if transportation with the outside world were cut off, the Hawaiians soon would suffer for lack of all common commodities except one necessary foodstuff—sugar, and two food luxuries—coffee and pineapple. Here, then, is our problem, to determine the reasons for such an absolute dependence on other countries.

ANALYSIS OF THE TRADE

An investigation of the agricultural statistics shows that sugar makes up 85 per cent (1919) of the value of all agricultural crops. Altho their location is such that imported supplies come at least 2000 miles, the production of foodstuffs for home consumption is neglected and almost the entire attention of the islands is centered upon producing sugar for export. This commodity furnishes three-fourths of the value of all outbound freight. The pineapple crop is second in importance, and furnishes about 10 per cent of the export. These figures show that sugar and pineapple dominate the economic interests of the islands. They influence not only the export trade, but they directly lead to peculiar phases of the import trade. These two industries require imported supplies, such as agricultural implements, pumping apparatus for irrigation works, sugar-mill equipment, and containers for raw sugar and preserved pineapple.

Why have the Hawaiian Islands specialized in the production of sugar and pineapple to such an extent that they neglect so easily grown a common food as rice?

LINES OF INVESTIGATION

Five factors have been found to bear directly on the problem: (1) physical environment suited to sugar culture, (2) demand in middle-latitude markets for sugar, and location of the islands with reference to the nearest large market, (3) acreage available for sugar culture extremely small, (4) non-geographic stimulus—the tariff on sugar, (5) land unsuited to sugar cane favorable for pineapple, which crop is closely related to the sugar industry in several respects.

Physical Environment Suited to Sugar Culture

The conditions of surface, soil, climate, and water resources fit parts of a few of the islands for sugar culture. Of the Hawaiian group of twenty islands, only the larger four are the sites of plantations. This study will be confined to these four major islands: Oahu, Hawaii, Maui, and Kauai.

The area available for agriculture is limited largely by topographic conditions. A brief consideration of the surface features will show the distribution of the arable land and the difficulties which confront large-scale agricultural operations.

The Hawaiian Islands are of recent volcanic origin and the four major islands are characterized by high central mountain masses with many steep-sided valleys. In a distance of ten to twelve miles the streams drop from elevations of several thousand feet nearly to sea level. Partially surrounding these mountain cores are narrow coastal plains, varying from less than half a mile to four or five miles in width. The mountains dominate the landscape to such an extent that the Hawaiians originally evolved their terms of direction from them. The word "mauka" signifies toward the mountain and "makai" toward the sea. Even to-day, the white people of the islands indicate directions by these terms.

All the sugar lands lie below 2000 feet. The alluvial flats and lower slopes of the disintegrated lavas constitute the chief sugar areas, and they lie between 20 and 500 feet above the sea.

Many of the cane fields are on flattish land where cane is carried to the mill relatively easily by auto truck or steam railway, but some are so handicapped topographically that special means of transportation have been necessary. On some plantations, where fields are cut off from each other by canyons, cane is transported in elevated flumeways which cross deep gulches. Where the cane is growing in deep valleys or on relatively steep slopes, it is hauled by aerial tramways to the upland whence it is flumed to the mill. From some upland fields cars loaded with cane come down steep slopes by gravity and the empties are hauled up by a cable operated by a stationary gasoline engine.

The mountainous character of the four major islands is largely responsible for the great variation in rainfall. Land situated as are the Hawaiian Islands in the path of the northeast trade winds, which are moving from cooler to warmer regions, would receive little rain if it were of low elevation. For example, some of the smaller islands of the Hawaiian group are less than 3000 feet above sea level and receive only enough rainfall for the growth of grasses. They are used as sheep ranches since there is no water available for irrigation. The high mountains of the four major islands lying athwart the path of the northeast trades cool the winds and precipitation results. As a rule the zones of heaviest rainfall are on the windward sides of the islands more than 3000 feet above sea level. At least a dozen places receive

more than 350 inches per year. On one of the islands at an elevation of 5080 feet is "Uncle Sam's dampest corner," where an average of 476 inches of rain falls annually. This gives the Hawaiian Islands the world record station, for Cherrapunji, commonly known as the station of heaviest rainfall in the world, has an annual average of 50 inches less. Heavy rainfall is not uncommon at relatively low altitudes on the windward slopes of the high mountains. For example, at Hilo, which is on the largest and highest island of the group—Hawaii—at an elevation of 100 feet 135 inches fall each year. On Oahu and Kauai the rainfall of the windward coast rarely exceeds 80 inches and in some places falls as low as 45 to 50 inches. The leeward coasts are deficient in rainfall, the amount varying from 15 to 40 inches near sea level.

On more than half the arable land irrigation is necessary for successful agriculture. Not only must irrigation be practiced on the dry leeward sides of the islands, but for a good stand of cane supplementary irrigation is needed where rainfall is less than about 80 inches. The porosity of Hawaiian soils is responsible for this high water requirement.

The heavy rainfall on the mountains furnishes water for irrigation. The small size of the islands and the large proportion of highlands in the central part of each one cause much water to be available for irrigation within a short distance of the arid lands. The dense tropical forests of the mountain slopes and the porosity of the underlying rock help to lessen run-off and make the highlands good collecting grounds for water supply. Many plantations divert water from the upper windward slopes of the mountains to the dry leeward lands by tunnelling thru the mountains.

Not only is there a difference of from 400 inches to 15 inches of rainfall in a distance of ten miles, but there are striking contrasts in temperature as well. Great variety exists, ranging from "the warmth of the continuous low-level summer to the chill of the persistent high-level winter," where snow caps the crests of Mauna Kea all winter long and where snow banks are not unusual in mid-summer. Frost never occurs below the 2500-foot level over the entire group of islands. Only the temperatures of low-lying lands need to be considered, for practically all agricultural lands lie below 2000 feet. Particularly suitable to sugar cane is the continuous growing season with little variation from winter to summer. The mean yearly temperature of Honolulu is 74° F. and the mean monthly temperatures vary little from this average—February 71° F. and August 78° F. The highest

temperature recorded in Honolulu in fifteen years is 87° F. the lowest is 56° F. So equable is the temperature, so free from sudden changes that the natives have no word for weather in their language.

Another factor which adds to the desirability of Hawaiian climate for sugar cane is the absence of tropical storms or hurricanes. On some windward plantations which are exposed to the steady northeast trades it has been necessary to plant groves of ironwood, but the leeward sugar lands are so free from wind that algoroba trees, which will not grow where swept by wind, are planted along the dry sandy sea-front to supply firewood.

The soils are of disintegrated lavas, washed down from the mountain cores onto the lower lava flows and onto coral reefs which subsequently have been elevated. The lavas contain large percentages of iron and lime and break down into a rich soil well fitted for sugar cane, which is distinctly a lime-lover.

Demand in Middle-latitudes for Sugar and Relation of Islands to Markets

The suitability of the physical environment of the Hawaiian Islands for the growth of sugar cane was appreciated early by Americans who took up residence there, but it was not until the islands were assured of a market for sugar that the large-scale commercial industry was established.

In the 1830's, enough sugar was produced to meet the needs of the small island population, and as early as 1837 some 4286 pounds were exported. The settlement of the western coast of the United States in the 1840's, '50's, and '60's opened a market for Hawaiian sugar. There the climatic conditions precluded the production of cane-sugar. The location of the islands 2000 miles from San Francisco gave them an advantage over Cuba and Louisiana, from which places sugar destined for the Pacific Coast would have required an expensive rail haul two-thirds of the way across the continent or else a water shipment by way of Cape Horn several times as long as that from Honolulu to San Francisco.

Before 1895, all Hawaiian sugar shipped to the United States was consigned to the nearest port, San Francisco. During the 1890's the growth of population in the West was less rapid than in the preceding decade and the production of beet sugar developed. The demand for imported sugar consequently increased at a slower rate and the Hawaiian sugar planters began to seek additional markets. In 1895 they shipped the first cargo of sugar for eastern United States by way of Cape Horn. That part of the United States presented a large

sugar market to serve which the Hawaiian Islands were handicapped by their great distance. The route from Honolulu to New York by way of Cape Horn is more than 14,000 miles, which distance entailed high freight rates. Moreover, the sugar shipped over this route arrived at its destination in a state of deterioration, due not so much to distance as to changes in temperature which resulted from passage thru equatorial latitudes and into cooler seas. In the year 1904–05, when one-third of the total Hawaiian sugar export went over this route, nearly as much sugar was shipped to San Francisco and then overland to New York.

The opening of the Tehuantepec Railroad in 1907 shortened the distance of the Hawaiian Islands from the New York market more than half and a great increase in movement of sugar thither resulted. The islands lie almost due west of the lowland break in the highlands of Mexico, which determined the location of this railroad. This road was completed after the American-Hawaiian Steamship Line had made an agreement to pay the railroad one-third of the rate charged upon shipments from Hawaiian ports to the Atlantic seaboard and guaranteed a definite tonnage movement.

The next improvement in transportation which facilitated the shipment of Hawaiian sugar to eastern United States was the opening of the Panama Canal in August, 1914. Altho the Panama Canal route is 1000 miles longer than that by way of the isthmus of Tehuantepec, it reduces both time and cost of transportation by making transferring of cargo unnecessary. With the opening of the canal the American-Hawaiian Steamship Line united its fleet to carry sugar by the all-water route. This steamship company is reported to be the largest single user of the Panama Canal.

These recently opened trade routes greatly stimulated the sugar industry on the islands. Now (1919) practically all the sugar export is shipped to the United States and furnishes 14 per cent of the sugar consumed in this country.

Small Acreage Available for Sugar Culture

In the Hawaiian Islands the expansion of the sugar industry is restricted by the small acreage useable for sugar culture. Of the total area of the islands, which is about 6,500 square miles, only 10 per cent is estimated to be arable or reclaimable. This means an area equal to about half of that of our smallest state, Rhode Island. Nor is all of this land planted to cane, for some is too poorly drained and some cannot be irrigated profitably. Only 350 square miles is used for

sugar cane. (Compare this area with that of the county in which you live.) A crop is ready for harvest in from 18 to 21 months, so each acre produces only about two crops in three years.

In response to these conditions, the sugar planters have sought to increase production by utilizing the sugar land more effectively. This has resulted in the abandonment of other crops on lands suitable for cane. Rice, which once was the second crop of the islands, now only makes up 3 per cent of the agricultural produce of the islands. It is raised on low flats at the mouths of valleys, where land is too poorly drained for sugar cane. Large quantities of rice are imported from the United States and from Japan to supply the Japanese who comprise half the total number of plantation laborers (1915).

As much land as could be used profitably for the production of sugar soon was devoted to that crop. When no more land could be added to the sugar plantations, then the planters turned to intensive methods of cultivation in order to gain higher yields per acre. The Hawaiian sugar industry to-day is said by many writers to be more intensive and highly scientific than that of any of the other cane-sugar producing regions of the world.

Not only have great strides been made in the application of science to sugar culture, but much has been done to improve methods and machinery for the extraction of sugar from the cane. Highly specialized machinery has been evolved and fully 95.46 per cent of the sugar in the cane is recovered in the Hawaiian mills. Even tho the islands have no coal or iron and the cost of manufacturing is almost prohibitive, there is a notable exception in the case of the Honolulu Iron Works which manufacture this specialized sugar machinery from iron and steel imported to the islands. This concern has acquired a rather wide reputation and has built machinery to equip mills in Formosa, Cuba, and the Philippines.

Non-geographic Stimulus—the Sugar Tariff

Added to the geographic advantages of the Hawaiian Islands for the sugar industry is a non-geographic factor—the tariff on all sugar coming from overseas into the United States except that from the American territories. Because of this protection, it has become profitable to cultivate more intensively and to reclaim lands by the construction of expensive irrigation works. The sugar industry has about reached its climax. In fact, it has been developed beyond the point justified by geographic conditions. It is estimated that one-fourth to half of the Hawaiian sugar industry could not survive

competition with the more cheaply produced Cuban product, were the duty on sugar to be removed. The difference in the cost of production in these two regions is largely due to geographic conditions.

Lands Unsuited to Sugar Favorable for Pineapple

Pineapple production and canning, the second most important economic activity on the islands, is closely related to the sugar industry. The pineapple belt lies above the cane belt, at altitudes of from 500 to 1200 feet. These lands are not too high for the production of sugar cane, but water is not available for their irrigation. The moisture requirement of pineapple is supplied by a rainfall of about 50 inches a year. The chief pineapple area is on the plateau in central Oahu where the rainfall is 49 inches.

The development of the Hawaiian pineapple industry has been recent, since about 1900. It has come with the perfection of modern canning methods. Ripe pineapple cannot stand the long distance shipment to the nearest continental markets and pineapples gathered green do not develop a normal sugar content in subsequent ripening. A relatively small amount of sugar is necessary for canning pineapple which is ripe before being cut. The pineapple industry is related to the sugar industry in other ways than this. It requires a maximum number of laborers during the harvest season, August and September, during which time the grinding season is about over and the sugar mills are closing down. Pineapple also is an important supplement to sugar in the way of supplying cargo to ships from September 15 to December 15 when there is practically no sugar moving and the American-Hawaiian Steamship Line cut their schedule down considerably. If it were not for the pineapple trade the sailings would be reduced even more.

Practically all of the pineapple pack is shipped to the United States. Since the opening of the Panama Canal there is a possibility of entering the European markets. The pineapple industry seems possible and practicable of extension.

Applying the Principle

It is obvious that so intensive a study as that of the Hawaiian Islands could not be made for all of the more important tropical Islands. The value of this interpretation lies not only in the knowledge gained of the Hawaiian Islands, but in the appreciation of the principle involved; that is adjustment to the physical environment which results in the development of an agriculture for the produc-

tion of commodities for export and the interdependence of tropical and middle-latitude lands. To test the understanding of this principle a survey of the more important tropical islands profitably might be made. Is their adjustment to the physical environment of the same type as that of the Hawaiians, or is there some special reason why they have not developed a notably large trade with the middle latitudes?

THE TROPICAL ZONE FROM THE WHITE MAN'S STANDPOINT

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Popular Impressions

The impression very generally prevails among the people of the United States that those portions of the world in the Hot Belt, between the Tropic of Cancer and the Tropic of Capricorn are of necessity far inferior in natural advantages to the countries of the North Temperate Zone. They look upon the Tropical Zone as a land where terrific heat, torrential rains, ravenous beasts, gigantic reptiles and pestiferous insects render life unbearable for a white man. They think of its area as made up of burning desert, impenetrable jungle or of fever-breeding swamps where, as at St. Paul de Loanda on the west coast of Africa, it is said a white man has to have twenty-seven different kinds of tropical fevers before he can consider himself acclimated. They are in entire agreement with Colonel Robert G. Ingersoll when he said, "I never knew a decent country where there wasn't any winter."

About fifteen years ago it was my very good fortune to spend my summer vacation of three months within the Tropics, stopping at Jamaica, the Isthmus of Panama, Guatemala and Mexico. The result of my observations was to give me a far more favorable opinion of the Tropical Zone than I had before entertained. No fevers troubled me and I not only kept well but comfortable and happy also, notwithstanding the fact that it was a very busy and active summer for me. Furthermore, I was greatly surprised and deeply interested by the attractions and the advantages which these regions undeniably possess.

Area

Of the five zones the Tropical contains a greater land area than any of the others except the North Temperate. It includes the tapering southern part of North America, the greater portion of South America

and Africa, a considerable strip across southern Asia and more than half of Australia. In addition it embraces the large island groups of the East and West Indies. Its desert areas are smaller than those of the North Temperate Zone, its swamps of less extent than those of the Arctic. Neither is the fertile and productive part all a jungle. It has more grassy plains and open hill and plateau and mountain country than it has of jungle.

BOUNTIFUL PLANT LIFE

It is in sections of the Tropical Zone that Nature is most lavish of her bounties. Trees, flowers and fruits grow with a variety and luxuriance that cause the traveler constant wonder. Leaves reach eighteen or twenty feet in length. The tropics have the finest cabinet woods—mahogany, rosewood and ebony—also dye woods. One chip of logwood will turn a tubful of water a deep and beautiful red. The tropics have the finest tree in the world, the royal palm; the finest flowers in the world, the orchids; and the finest fruit in the world, the mango; the most useful tree in the world, the cocoa palm. This last named tree furnishes man with food, drink, soap, clothing and shelter. The tropical birds have a color and plumage that can not be matched elsewhere and the butterflies are the most brilliant and gorgeous in the world. When the pimento is in bloom on the tropical islands its fragrance is wafted out miles over the sea. At night the air is saturated with the scent of the jasmine and the tuberose. A single pineapple will scent up an entire house with its fragrance and it is so tender that it can be eaten with a spoon. The tropics are the region of superlatives, of greatest growth, of finest flavors, of sweetest odors and brightest colors. The attractions of the tropics are for every day thruout the year instead of the very brief seasons of blossoming and fruiting and seed time of the Temperate Zone. To inhabitants of the Temperate Zone who suffer from the long winters and the frosts of late spring and early fall the Tropical Zone seems strongly attractive.

It comes as a surprise to the traveller in the tropics to note that it does not get so hot there as in parts of the Temperate Zone. The thermometer rarely goes above ninety degrees. While the sun's rays at noon are hotter in the tropics than in the Temperate Zone this is counterbalanced by the greater number of hours of sunshine in the Temperate Zone. When the sun rises at four or five o'clock and sets fourteen or sixteen hours later there is an accumulation of heat which causes the sweltering hot summer nights to which some of us are accustomed. In the tropics the sun rises at about six o'clock

and sets at about six the year around and in the long nights it always gets cool before morning. And so the hot spells of places like Kansas City or St. Louis are more intense than the hottest days at Panama or Rio. The annual temperature range in some places in the Temperate Zone is over 140° while in the tropics it is about 25°. Accordingly it has been said that our zone should be called the "intemperate zone" rather than the temperate.

TROPICAL HOUSEKEEPING

The advantages of the Tropical Zone housekeeper should not be overlooked. Overshoes, gloves, winter clothing, caps, all are unnecessary. The house has no storm windows nor doors, no furnace nor heating stoves. There are no fires to keep, no fuel nor ashes to handle, no coal bill to pay nor coal strike to worry over.

DISEASE CONTROL

The really great drawback to the development of equatorial countries in our own times has been the tropical diseases, such as yellow fever and Chagres fever, blackwater fever and other forms of malaria. It was these fevers that caused the French Canal Company under the great de Lesseps to fail. But in our own times the very great discovery was made that yellow fever and malarial fevers are carried and communicated by the bite of certain species of mosquitos. Modern sanitation is thoro enough to practically banish the mosquito in the fever districts and so do away with the fevers. Where sanitation prevails the death rate in the tropics has been reduced as low as in the Temperate Zone, and it can not longer be maintained that white men cannot live in these regions.

INDUSTRIAL POSSIBILITIES

While man has been robbing the Tropical Zone of its terrors he has at the same time been learning its great industrial possibilities. The material resources of these regions are almost limitless. Here are some of the richest gold and silver mines of the world, great deposits of copper and nitrates and some of the richest iron ore deposits in the world. Here are also great oil pools, important diamond fields, and great forest wealth. Great possibilities for hydro-electric power development are to be found here. Here also are raw materials in the greatest abundance and here the cheapest labor supply, particularly labor of the unskilled type.

AGRICULTURAL PRODUCTS

The agricultural products of the Zone are numerous and important. Many of them are grown in the Tropical Zone only, so that they are without competition from the agriculturists of the Temperate Zone. The tropics have a monopoly of the great beverage products, coffee, cocoa, and much of the tea and maté. Sugar cane, a tropical plant, is distinctly superior as a source of sugar to the sugar beet. Silk belongs to a limited degree to the tropics and the true home of the cotton plant is there. Rice is grown largely there. The great food producing plants, banana, plantain, yam and cassava grow almost exclusively there. In the same region belong such choice fruits as the mango, papaya, avocate and the pineapple and of course the tropics have a monopoly of the spices and condiments—pepper, allspice, nutmeg, cinnamon, clove and ginger.

HIGHLAND REGIONS

The influence of altitude must not be overlooked in any consideration of the habitability of the Tropical Zone. Great tracts of territory, much more extensive than the jungles, have an altitude of more than three thousand feet and enjoy a climate of perpetual spring, over large areas the thermometer never going above 75° or 80°, nor lower than 60°. Such regions are the most delightful spots in the world, a sort of California without the chill and the frost dangers of winter. These regions produce the crops of the Temperate Zone, and within a short distance of the lower altitudes where the hot belt products grow. Within a few miles are wheat and bananas, potatoes and cassava. The elevated portions also are rich in minerals. From these varied resources it may be seen that many of the areas within the tropics have the productive advantages of both the zones. It may be seen also from this that the tropical nations, many of them, have the natural advantages to make themselves economically independent, as France approximates the powers of the Temperate Zone. Such countries are Mexico, Guatemala and the other Latin American countries in the plateau and mountain section. They have within their own borders everything necessary for the life of a modern state.

HASTY JUDGMENTS

It is a characteristic American trait to fail to appreciate the good points of other nations and peoples. I have heard my countrymen, in the Latin-American countries, refer to the natives, in their hearing, as "niggers," when they had not a drop of Negro blood in their veins.

Such an attitude not only injures our commercial and social relations with these peoples but keeps us in ignorance concerning the developments going on in other parts of the world. An American visitor to Georgetown, in Demarara, British Guiana, gives a humorous account of the only preliminary impressions he had formed of that region. Instead of finding a people sunk in superstition and barbarism as he had expected he found himself, on landing, to be in a thoroly modern city and the first natives he noticed were "sandwich men" advertising the moving picture programs at the theatres. An American young lady of education, a teacher, writes this year on leaving Rio de Janeiro after an unbroken stay of three years there, that it is a "wonderful city," that she is really homesick on leaving and that she has learned to "love the tropics." In order not to forget that "Hinter dem Berge sind auch Leute" let us notice the following very incomplete list of cities of the Tropical Zone which have populations of over 200,000.

Batavia	240,000
Belem (Para)	300,000
Bombay	900,000
Calcutta	1,220,000
Delhi	225,000
Hangkow	1,500,000
Hongkong	561,000
Hyderahad	503,000
Madras	518,000
Mexico City	1,000,000
Rio de Janeiro	1,200,000
Sao Paulo	510,000
Shanghai	1,100,000

POSSIBILITIES

Numerous as are the large cities of the tropics there are still great areas which are undeveloped. This is particularly true of the Americas and Africa. The great tropical belt of South America and Africa has an area of 10,000,000 square miles, more than three times the area of the United States, and a population of 115,000,000, or practically the same as this country. These regions have at present only about eleven inhabitants to the square mile. Crops grow 365 days each year instead of 120 to 200 days as in the best portions of the North Temperate Zone and hence should support a correspondingly greater number of people. The possible productive capacity of these two areas (South America and Africa) was computed a number of years ago, as follows:

Vegetable and animal products	$13,500,000,000
Mineral products	$ 2,500,000,000
Total	$16,000,000,000 annually*

* S. P. Verner, The White Race in the Tropics. *World's Work*, 16: 10,715.

It is needless to point out that the present production of these regions is far short of the above figures. They show instead the great possibilities ahead of the men and the nations who will give of themselves and their wealth for this development. The Star of Empire has moved westward as far as it can under present conditions and now it must move to the south. The world's great powers, excepting the United States, are thoroly awake to the great possibilities. Within this generation the whole of Africa practically has been partitioned among the great European powers. At the outbreak of the World War when Germany sounded out England to learn if it would be willing to remain neutral instead of coming to the aid of France, Germany was willing to respect the territorial integrity of France but not of its colonial possessions, thus showing a greater desire for the French colonies than for even the mineral and industrial regions of northeastern France.

TRANSPORTATION

In the coming development in the Tropical Zone, railroad building will play a most important part. The great fresh water navigation systems of the Congo, the Amazon and the Orinoco and their tributaries open up the lowland districts with their swamps and jungles but fail very largely to provide access to the most healthful and most easily cleared and developed sections—the hill, plateau, and mountain districts. Considering the way the railroads pushed ahead of settlement and development in the Western United States it would seem that the same might be done in the tropics and that development would follow the railroads even more rapidly there than it has done with us. The great restlessness in Europe and the desire of millions to emigrate from the war-impoverished countries there would indicate what a migration might take place to the tropics if opportunity offered.

THE RACE PROBLEM

It is not to be expected that the coming development of the tropics will be free from perplexing problems either in the Latin republics of South America or in the African colonies of European nations. The colored races will undoubtedly always predominate there in numbers and judging from past experience it cannot be doubted that the white races will be actuated, in a large degree, by greed and selfishness in their control of the native races. There are still many uncivilized peoples in those regions, the mixed races—mulattoes, mestizos and zambos—are unpromising material and the efficiency of both Indian and Negro is generally low. Nevertheless they are not without their

merits as laborers. Both races do their best in "team work" on large enterprises. The Latin-American laborers have constructed great works—water supply, irrigation, drainage and railroads. The West Indians, of African descent, did the real manual labor of digging the Panama Canal. Both races are well adapted to the climate, they are docile, they live cheaply and are accustomed to hard work. All travellers in the tropics have seen the familiar sight of natives—both women and men—coaling the large ocean steamships by carrying the fuel in baskets on their heads. The development of the tropics will be accomplished by the labor of these people under the direction of the white race and aided by their machinery.

AGRICULTURE IN THE TIME OF VERGIL

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Agriculture has been defined as the science which teaches how every kind of land should be planted and cultivated and how to know what kind of land will produce the largest crops for the longest time.[1] The practice of agriculture began in pre-historic times.[2] No one knows which was introduced first, animal husbandry or the cultivation of plants. Owing to the migratory habits of the early peoples it is quite possible that animals were domesticated and used as beasts of burden before tillage of the soil was practiced.

Perhaps the earliest form of the cultivation of the soil consisted of a selection of plants preferred for food and clothing and an attempt to root out from among these those that were obnoxious. Later followed seed-gathering and sowing.

The first agricultural implements were very crude, consisting of pointed sticks in various forms and combinations.

Agriculture became a leading industry as early as the time of Homer,[3] and was regarded by the Greeks as the very groundwork of social life and the most legitimate way of making a living.

In Italy also the existence of the community was based on agriculture. This gave rise to the custom of marking a new town site by the furrow of a plow. Mention is made of this by many of the classical

[1] Varro, III.
[2] New International Ency., Agriculture.
[3] Harper's Classical Dictionary, Agricultura.

writers, among whom is Vergil. In his description of the building of "New Carthage" is this statement:

> Some with due care
> Choose where to build and close the space around
> With sacred furrow. (Aen. I, 425)

Manual labor was held in high repute by the early Romans. Even Cato worked in the field beside his slaves. When the early Romans wanted to commend an honest man, they termed him a good husbandman or a good farmer. Vergil thus expresses this national pride:

> Our manly prime
> In willing labor lives, and is inured
> To poverty and scantness; we subdue
> Our lands with rake and mattock, or in war
> Bid strong-walled cities tremble. (Aen. IX, 607–609)

ANCIENT AGRICULTURAL WRITERS

Among the ancients there were many writers on the subject of agriculture. More than fifty of these were Greeks of whom perhaps Hesiod was the most prominent; but of all the ancients who wrote on this subject perhaps Mago, the Carthaginian, had the greatest reputation. Neither was Rome lacking in noted men who wrote on agriculture. Among the most prominent were Cato (234–149 B. C.), Varro (116–28 B. C.), Columella (middle of the first century A. D.), and Pliny (23–79 A. D.). Vergil's "Georgics" forms a link in a chain of serious treatises on agriculture, the first of which is that of Cato. The purpose of the whole series was to win the nation back to the study and discipline of its youth.[4]

As Rome had increased in wealth and resources from her colonies, agriculture in the home-land was being neglected. The number of slaves had materially increased so that the average Roman had become a man of leisure with much time for the pursuit of pleasure. The thinking men of the time realized the danger of such conditions and were using both their personal influence and the power of the pen to win the people back to their first love. The whole of the "Georgics," the most artistic and best written of all of Vergil's works, is devoted to this purpose.

Vergil drew freely from the older writers on the subject and it is quite possible that he had personal association with Varro while writing his own treatise.[5]

[4] Cruttwell, A History of Roman Literature, p. 261.
[5] Fairfax Harrison, Roman Farm Management, p. 11.

Added to his extended reading on this subject Vergil had the advantage of the knowledge gained by his early life on his father's farm. His great knowledge and deep love for agriculture could not have come alone from a study of books.[6]

Altho this ancient treatise on agriculture is mainly applicable to Italy, yet the modern farmer may find much that is profitable for his own use at the present time. He will not find in it anything about bacteria and the "nodular hypothesis" in respect to legumes, but he will find a background for his daily routine and an appreciation that two thousand years ago men were studying the same problems and solving them by intelligent reasoning.[7] The characteristics of the Roman method were thoroness and patience.

Vergil's treatise, the Georgics, is separated into four divisions:

First Georgic: Crops and Their Cultivation
Second Georgic: The Culture of the Vine
Third Georgic: Animal Husbandry
Fourth Georgic: Bee-keeping

Ancient Methods

The Roman agriculturist understood the principle of allowing the soil to grow warm in the spring before planting the seed:[8]

In earliest spring when from the mountains white
The frozen rains dissolve, and zephyr's breath
Loosens the yielding clod from frosty chain,
Then and no later, let thy plough drive deep,
Thy oxen groan, and burnished by its toil,
Thy gleaming ploughshare from the furrow shine.
(Geor. I, 43–46)

The 'deep ploughing' was a necessity to conserve the winter rainfall of the Mediterranean countries for spring growth. Varro in discussing the preparation of the seed bed says that the first and second principles of good agriculture are good ploughing.[9] Light plowing to make a dry mulch to conserve the moisture was commonly practiced. Passages in Vergil show that exposure of the slopes to sun and wind was also closely observed as well as the thickness of the soil (See Geor. I, 50–53).

Among the Romans the land was often allowed to lie fallow or rotation of crops was practiced, sowing leguminous crops between, to

[6] Sellar, Roman Poets of the Augustan Age—Vergil, p. 191.
[7] Harrison, Roman Farm Management, p. 1.
[8] K. C. Davis, Productive Plant Husbandry, p. 3.
[9] Harrison, Roman Farm Management, p. 38.

conserve the fertility. Macaulay said that the Romans did not know that the leguminous roots are "endotropic mycorrhiza" but that their practice of soil improvement with legumes was just as good as ours. In poetic language Vergil expresses this fact thus:

> In odd years, also, let the close-grazed fields
> Lie fallow, while the resting land crusts o'er
> Neglected; or beneath some later star
> Sow golden corn, where once the humble crops
> Were pulse, with shaking, bursting pods, and growth
> Of tiny-seeded vetches, or frail stems
> And whistling patch of lupine, bitter weed!
> (Geor. I, 71–76)

The soil was also built up by manuring combined with the rotation of crops. Much of the land either had to lie fallow or be manured:[10]

> The change of crops makes light work. But fear not
> To soak the land with good, rich dung, or strew
> Waste ashes where the wide fields lie outworn.
> Thus changed harvest give your lands repose,
> For earth unploughed has many a gift in store.
> (Geor. I, 79–83)

IRRIGATION AND DRAINAGE

Italy, as well as the other Mediterranean countries, is a land of winter rains and more or less summer droughts. Eclogue VII, 57–58 gives a description of a drought in Italy:

> Our field is burnt up; in the tainted air
> All greenness dies, and Bacchus shades no more
> The vine-clad slopes.

Irrigation and drainage were frequently practiced by the Romans much as they are at the present time in the Mediterranean. Vergil gives a vivid picture of both in the first Georgic:

> Why tell of him who when his seed is strewn
> Attacks his field forthwith and smooths away
> The mounds of sterile sand? Soon o'er his crops
> He guides a flood of hastening rivulets;
> For when his acres burn and green things die,
> Look! from the forehead of the channeled hill
> He lures the waters down. The tumbling streams
> Make a hoarse murmur on the polished stones
> And pouring free, relieve the thirsty land.
>
> ---
>
> Another from some saturated bog
> Drains off the gathered waters, chiefly when
> The river, after months of changeful sky

[10] Conington, 'Vergil.' Vol. I, p. 75.

Swells o'er its banks, filling wide flats with slime,
And from the swamp-holes steams the heated ooze.
(Geor. I, 104–117)

ITALIAN AGRICULTURE

In the first Georgic is also given a list of the implements used in farming; the plow, the harvest wains, threshing sledges, drags, harrows, baskets made of osiers, hurdles, and the winnowing-fan. In these may be recognized the ancestors of many of the implements used in modern agriculture. The manufacture of the plow is described from the time the tree is growing in the forest until the finished product is ready for use.

Neither was the Roman farmer free from insect and animal pests. The poet tells of the mouse, mole, toad, the weevil that destroys the grain, and the ants. Well might he say:

Great Jove himself ordained for husbandry
No easy road, when first he bade earth's fields
Produce by art and gave unto man's mind
Its whetting by hard care. (Geor. I, 121–124)

The crops mentioned for spring planting are beans, Medic clover and millet; those for the fall, flax, poppies, wheat, spelt, barley, kidney beans, vetches, and lentils. This again shows an adjustment of the crops to the season because the greater number of crops are planted in autumn at the beginning of the winter rains. Cereals and other grasses with superficial roots, depending on surface moisture, sprout in the warm rains of autumn, grow slowly in winter, and blossom and seed in spring.[11]

Italian agriculture, even when cereals were the principal crop, was in the main of the intensive type.[12] There was more than one cause for this fact. The machinery was very crude and the land was not very well suited for its use because of the irregularity of the physiographic features. Then, too, slave labor was plentiful and cheap. The land was plowed and cross-plowed. Sometimes even a third plowing was required and if meadow land was to be broken up the use of the mattock and harrow was necessary to break the clods. This was a slow and laborious process. Oxen were used for the plowing and harrowing. The mattock of course was wielded by hand. Vergil expresses it thus:

He also who shall break the sluggish clods
With rakes, and drag the osier hurdles o'er,

[11] Semple, Influences of Geographic Environment, p. 15.
[12] Frank, Economic History of Rome, p. 93.

Prospers his tillage well, and not in vain
Him golden Ceres from Olympus views.
Nor him who o'er the once-ploughed land upturns
Again his ridges, and with oblique share
Cuts cross-wise; for he trains his land to toil,
And is true captain of obedient fields.
(Geor. I, 94–99)

The careless farmer was to be found among the ancients as well as the moderns. This vivid picture of him is given in Geor. I, 155–159.

Wherefore unless with frequent harrowings
Thou dost compel thy land, and with loud cries
Scarest the crows away, and prunest close
All over-darkening branches, and with prayer
Dost win full rains from heaven,—then alas!
Thou shalt in vain behold the bursting barns
Some neighbor hath, and stay thine appetite
On forest acorn shaken from the tree.

The hard labor of the prosperous farmer in the hot mid-summer is suggested in this admonition:

Plough naked, sow naked. (Geor. I, 299)

Mixed with his common sense, his practical knowledge, and with the scientific principles of agriculture, the Roman farmer had much superstition and legend. He, as well as the peasant farmer the world over, believed in the influence of the moon on his crops. Vergil says:

The moon herself
Ordains the days which for their fitting tasks
Are omened well. (Geor. I, 276–277)

Again in the same poem he says:

T'was by Jove's own grace decreed that by sure signs
Men prophesy of droughts, rain, frost, and winds,
Watching the admonitions of the moon,
Marking what bodes a gale, what oft-seen signs
Bid herdsmen keep their cattle near the barn.
(Geor. I, 351–355)

Plant Propagation and Cultivation

Plant propagation in its varied forms, both natural and artificial was known to the Roman farmer.[13] He made use of suckers, settings, layering, cuttings, pieces of cleft wood, grafting, and budding in the development of new plants. The second Georgic gives a comprehensive and detailed description of these methods. The Roman farmer

[13] Harrison, Roman Farm Management, p. 142.

knew and practiced the art of domesticating and improving the wild fruits. Wild stocks were also used for grafting and budding.

Perhaps most of all the olive and the grape have contributed to the wealth and comfort of the Italian people. As the soil became thin from erosion and would no longer successfully grow cereals, the Roman farmer began to turn to vine and olive culture. In the thin soil of the hillsides a hole was hacked out in the weathered rock and filled with soil to nourish the roots of the young plant. As the plant grew stronger the roots worked their way down into rock crevices and found their own nourishment where the annual crops of grain would fail.[14] This method is well-expressed by Vergil in the second Georgic:

> Steep Ismara
> Blooms well with Bacchus' gift and olives fair
> Mantle Taburnus' mighty sides with green.
> (Geor. II, 37–38)

This method could be followed only by the wealthier class of farmers because it necessitated a wait of five years for returns from their vineyards and fifteen years from their olive groves.[15] When it became evident that both the vine and olive were well suited to the climate and soil and that they would yield good returns on the investment, planting became more general and on better types of soil. To avoid the long wait for returns the farmer planted grain and vegetables between the rows of vines or other fruit trees.[16] In the bright sunshine of Italy the small plants thrived better for the partial shade given by the vines and trees on which they were trained.

The olive flourishes in the "Mediterranean climate," especially on well-sheltered slopes with limestone soil. The Mediterranean coast has many deep valleys that lead to the mountainous interior. Regular land and sea breezes in summer cause deposition of heavy dew in these valleys and supply enough moisture for the growth of the olive without artificial irrigation.[17] The following quotation shows that the Romans of this time appreciated the great value of a tree crop:

> For otherwise the olive's growth requires
> Slight skill or care: of sickle's rounded blade
> Or harrows diligent they have no need;
> But when well rooted in the clod, resist
> Assaulting winds. The common soil supplies

[14] Frank, Economic History of Rome, p. 55.
[15] Frank, Economic History of Rome, p. 56.
[16] Frank, Economic History of Rome, p. 98.
[17] Andrews, A Textbook of Geography, p. 94–95.

Moisture enough, and broken by the plough
Full fruitage gives. Therefore do not fail to plant
The plenteous olive, blessed leaf of peace.
(Geor. II, 420–425)

Grapes were very common in Italy in the time of Vergil and the vineyard was an important part of almost every farm. The vines were planted both on the hill sides and in the valleys but required different treatment. We read

If rich and level be the land you choose,
Plant close, for vines give no less plenteous yield
When close; but for a mounded land or hills
Steep sloping, set in fair and ordered lines,
Planting the vines with measure scrupulous,
Till each long path with every crossing squares.
(Geor. II, 273–278)

The vines were trained by props to run onto trees which were set about forty feet apart. This method of grape culture is still practiced in many parts of Italy. Any kind of tree might be used but the fig, elm, or poplar was preferred.[18] Varro recommended the elm tree because it supported the vine, yielded leaves for forage, and supplied rails for fences and wood for burning.[19] The constant care required by the vineyard is expressed in Georgics II, 397–401.

Yet for the laborers in the vineyard waits
A further toil, of which there is no end.
For yearly the whole field must furrowed be
Thrice and again and everlastingly
The clods be broke with mattock deeply driven,
And all the planting clean-stripped of its leaves.

ITALIAN WINES

In ancient times Italy was celebrated for its wines. The best varieties came from vineyards grown on the two slopes of the Apennines.[20] The Falernian, the Massican and the Cacuban wines came from Campania. These three were the ones most highly praised by the poets.[21] Vergil mentions a number of the best-known varieties of wines common to the Mediterranean countries in the second Georgic.

The configuration of Italy gives a variety of soils. In the lowlands are moist soils with springs depositing tufaceous limestones; above are gentle slopes of soft fertile soils suited for vines; high up are grey lime-

[18] Frank, Economic History of Rome, p. 99.
[19] Harrison, Roman Farm Management, p. 102.
[20] Ency. Brit., Wines.
[21] Deecke, Italy, p. 200.

stone cliffs.[22] All these different soils with the crops suited to each are mentioned and described by Vergil. Such adaptation of crops to topography and soil is expressed in the following:

> Earth that is almost black,
> Rich when upturned, a loose and crumbling soil,
> Such as ploughs make by art, for all grain-crops
> Is fittest. (Geor. II, 203–205)
> But hillocks of dry gravel scarcely yield
> Wild cassias for thy bees and rosemary.
> (Geor. II, 213)

Animal Husbandry and Bee-keeping

Among the other prominent Roman industries pertaining to the farm were animal husbandry and bee-keeping. Since the elder Vergil practiced both and the poet spent his youth among such surroundings it is not surprising that he has devoted the third and fourth Georgics to these subjects. In the third Georgic is a full discussion of the breeding, raising, and the diseases of cattle, horses, sheep, and goats.

Bees were much prized for their honey and the poet thought them worthy of close study. The fourth Georgic tells the life history of this humble servitor and his gift to man.

Vergil's Appreciation of the Farmer

Vergil's love of the country and his appreciation of the farmer as the foundation of the Italian civilization has given to the world this beautiful picture:

> Oh, more than blest, if their true bliss they knew,
> Are tillers of the land! Whose sustenance
> From civil faction far, the righteous earth
> Ungrudgingly bestows. Their house at morn
> Sends forth no lengthening stream of flatterers
> From crowded halls through lofty gates of pride;
> No columns with rich tortoise jeweled o'er
> Wound envious eyes, nor hangings prankt with gold.
> Nor brass Corinthian, nor once virgin wool
> Tainted with Tyrian poison, nor clean oil
> Of olive with lascivious odors fouled.
> But peace is theirs untroubled and a life
> From falsehoods free, their riches manifold
> Are calm, with ample fields, pools fountain-fed,
> Caverns of rest in cold Thessalian vale,
> The lowing herd, soft slumber under trees,
> Green upland coverts, haunt of creatures wild.
> Their youth in labors indefatigable

[22] Deecke, Italy, p. 378.

Is schooled to few desires; the gods receive
Fit sacrifice and festival, and old age
Is hallowed. 'Twas among such country folk
The Virgin Justice, when she quit mankind,
Left her last footprints upon earthly ground.
(Geor. II, 458–474)

TENTATIVE FORMULATIONS OF (1) THE PURPOSE OF THE SOCIAL STUDIES IN THE SCHOOLS AND (2) THE DISTINCTIVE CONTRIBUTION OF EACH FIELD OF STUDY

In order that the representatives of the National Council of Geography Teachers on the Joint Commission on the Presentation of the Social Studies in the Schools may have the benefit of suggestions and criticisms of many geographers the following tentative formulations are published in the JOURNAL. Your representatives ask all geographers to study these tentative formulations of the distinctive contributions of the various social studies and especially that of geography and send their suggestions and criticisms to one or the other of the Council's representatives so that at the coming spring meeting of the Commission we may be able to reflect the thought of geographers on this important question.

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THE PURPOSE OF THE SOCIAL STUDIES IN OUR SCHOOLS

The organization of the social studies in the schools should be determined by the purpose for which those studies are introduced. Their purpose is to enable our youth to realize what it means to live in society, to appreciate how people have lived and do live together, and to understand the conditions essential to living together well; to the end that our youth may develop such abilities, inclinations, and ideals as may qualify them to take an intelligent and effective part in an evolving society.

THE DISTINCTIVE CONTRIBUTION OF HISTORY TO THE SOCIAL STUDIES

The distinctive contribution of history to the social studies is to portray human events and activities as they actually occurred; its guiding principles are continuity and development. Therefore these

events and activities are not regarded as isolated and unrelated or as of equal importance. Every condition or event is conceived to be related to something that went before and to something that comes after. Conditions and events are deemed important in so far as they serve to throw light upon some course of development. More briefly, then, the special and peculiar function of history is to trace development.

History places, and helps to explain, successive stages in the development of mankind. It constantly extends backward the memory of living men and gives them a sense of perspective to aid them in forming their judgments on contemporary affairs. In the light of history our most valued social possessions are seen to be deeply rooted in the past but the world is viewed as undergoing a continuous process of adjustment and change. Finally, history seeks to give students an intelligent notion of those human activities, decisions, and achievements which lie behind our present-day institutions and problems.

THE DISTINCTIVE CONTRIBUTION OF ECONOMICS TO THE SOCIAL STUDIES

The distinctive contribution of economics to the social studies is the understanding it gives of the processes by which men get a living. A very large part of human activity is devoted to the process of getting a living. One of the most significant things about our world is the fact that nature does not gratuitously supply all, or even many, of the commodities and services desired. In consequence, we "struggle" to get a living; we learn to "economize" (in the broadest sense of that term) in the selection and utilization of effective means of gaining desired ends. These activities are *our economic activities*. They are carried on largely in group life and, even when most individual, are affected by group life. Economics, then, promotes a realization of what it means to live together and an understanding of the conditions essential to living together well, because it helps to explain the organization and functioning of an evolving society from the point of view of the social processes of making a living.

Economics sets forth, for example, certain aspects of our specialization, our interdependence, our associative effort, our technological struggle with nature, our pecuniary organization of the production and sharing of goods, our utilization of labor under the wage system, our market exchange, our international economic relations, our scheme of private property and competitive effort—all of which have become vital parts of our present social organization—and it shows how all of

these function in enabling us to work and to live together. Concerning these economic processes certain generalizations or laws have been worked out and they are available as standards or guides for individuals and for groups.

Living together well in a democracy will be furthered if its people take an intelligent part in the guidance of the process. It is in this connection that it becomes peculiarly important that there should be a wide-spread knowledge of economic generalizations. Since a large part of our activities are economic activities, problems of competition, combinations of capital and of labor, distribution of income in relation to the common welfare, trade, transportation, and finance (to cite only a few) will always receive a large share of attention by every society which is concerned in restraining, regulating, and promoting economic activities that affect the social welfare. If democracy is to succeed, a large number of its members must learn to form intelligent judgments upon economic issues—to make those wise choices between alternative courses of action which are the real essence of "economy" broadly conceived. They can do this only provided they come to know the general plan or organization of our economic life, and to appreciate the existence and character of economic law in both domestic and international relations.

The Distinctive Contribution of Political Science to the Social Studies

Political science is the study of the state, a term which includes all forms of political organization. It deals with the life of men as organized under government and law. As its distinctive contribution to the social studies, it gives an understanding of social control by means of law and of the promotion of general welfare by means of governmental action.

Political science includes a study of the organization and the activities of states, and of the principles and ideals which underlie political organization and activities. It deals with the relations among men which are controlled by the state, with the relations of men to the state itself, and with those aspects of international life that come under political control. It considers the problems of adjusting political authority to individual liberty, and of determining the distribution of governing power among the agencies thru which the state's will is formed, expressed, and executed.

Political science seeks to develop in individuals a sense of their rights and responsibilities as members of the state, and a realization

of the significance of law. It substitutes accurate information and intelligent opinion for emotions and prejudices as a basis for forming judgments in politics and world affairs.

THE DISTINCTIVE CONTRIBUTION OF SOCIOLOGY TO THE SOCIAL STUDIES

The distinctive contribution of sociology to the social studies is to show that, however much may be allowed for individual initiative and for natural environment, human life has been conditioned more by its social setting than by any other cause. Understanding of the social setting results from study of society as a composite unity made up of many interrelated groups and carrying on many interdependent activities all of which are conditioned by certain ever present types of causation. The multitudinous and repetitious manifestations of these types of causation are more or less subject to statistical treatment and make up those trends of social change a full statement of which would be social laws. Sociology studies the various forms of causal relations between the activities of individuals that are always occurring in homes, schools, neighborhoods, crowds, publics and whereever human beings meet, and that give rise to public opinion, customs and institutions.

Sociology also studies the problems of population as affecting all types of social activity, the effects of small and large numbers, of sparse and dense distribution, of differences in the quality of the individuals who compose the population, both their inborn traits as determined by racial and family heredity, and the acquired traits which result from prevalent vices, diseases, occupation and mode of life. This branch of sociology includes certain aspects of the problems of immigration, eugenics and public health.

It studies the causes, prevention, and treatment of poverty and crime.

It makes a comparative study of different societies, including the most primitive, which reveals the social origins and the method of progress. This comparative study shows that nothing is too repugnant to us to have been customary somewhere and that we must be slow to think that anything is too ideal to be possible sometime, for customs and institutions are as variable as the states of mind and feeling which issue from social causation.

The study of sociology tends to dissolve the prejudices and bigotries which are the chief obstacles to social co-operation by showing that such prejudices are mostly formed at an age when rational judgment

on fundamental problems is impossible, and that in the overwhelming majority of instances those who differ from each other most radically would hold similar opinions and sentiments if they had been molded by similar influences.

Sociology affords a clear view of the aims of education for it shows that distinctively human nature is second nature socially acquired and that if from birth one could be excluded from all social contacts he would remain a naked savage and a dumb brute. It illuminates the methods of education by its study of the effects of social contacts, and it supplies materials for moral instruction in the schools by its study of the relations between society and the individual and of the interdependence of groups. Such study presents in its full light the fact that all social life is team-work. It tends to evoke the spirit of cooperation. It reveals grounds for ethical requirements and sources of ethical incentive.

THE DISTINCTIVE CONTRIBUTION OF GEOGRAPHY TO THE SOCIAL STUDIES

As its distinctive contribution to the social studies, geography gives an understanding of earth conditions and natural resources as the material basis of social development by showing the relationships which exist between natural environment and the distribution, characteristics, and activities of man.

This understanding of the relationships between man and his natural environment is acquired largely thru comparative studies of specific groups of people living in specific regions. Such studies show how variations in different peoples reflect the influences of their respective environments; in many cases they also lead to the discovery of geographic principles. A knowledge of these principles, or generalizations, contributes, among other things, to an appreciation of the wisdom of utilizing earth resources efficiently, and in many cases points the way toward a more harmonious adjustment of man to his environment.

The realization that differences in peoples result in part from differences in natural environment also helps to promote a sympathetic understanding of peoples in that it affords a key to the explanation of characteristics and attitudes likely otherwise to be misunderstood.

The study of the peoples of varied regions in different parts of the world discloses, moreover, their interdependence and reveals the fact that the environment affecting each group of people has come, thru means of transportation and communication, to embrace practically the

entire earth. The idea of earth unity derived from the realization of such interdependence is another contribution of geography to the social studies, and is essential to the understanding of world affairs.

Respectfully submitted,

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W. H. KIEKHOFER } *Representing the American Economic Association*
L. C. MARSHALL }
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GEOGRAPHICAL NOTES AND NEWS

The Maine Council of Geography Teachers was organized at Bangor, October 28, 1922, at the annual convention of the State Teacher's Association. The Council was fortunate in securing as principal speaker Captain Donald B. MacMillan, who had just returned from a fourteen months' cruise in the Arctic. A constitution was drawn up and adopted, and the following officers elected.

Executive Committee

Hazel D. Shields, Portland, Chairman
Burton W. Irish, Portland, Secretary-Treasurer
Lucius H. Merrill, University of Maine
H. W. Mann, Maine School of Commerce
Carrie E. Small, Portland
Mabel F. Ryan, Gorham Normal School
Charles S. Preble, Farmington Normal School
Harry P. Taylor, Bangor

The New Jersey State Council was organized October 7, 1922 under the direction of Miss Ella Huntting of the Montclair State Normal School. The principal speaker was Professor J. Russell Smith of Columbia University.

The New Hampshire State Council held its first meeting at Manchester October 21, 1922 and completed an organization under the direction of Professor E. D. Elston of Darmouth College. President W. W. Atwood of Clark University was the principal speaker.

*The other representative of the American Historical Association, Mr. Henry Johnson, was able to attend only the second of the three meetings of the Commission and considers his part in the proceedings insufficient to warrant him in attaching his name to the report.